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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/764,486	01/27/2004	Tokuharu Kimura	040024	6268

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EXAMINER

HU, SHOUXIANG

ART UNIT PAPER NUMBER

2811

DATE MAILED: 04/21/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/764,486

Applicant(s)

KIMURA ET AL.

Examiner

Shouxiang Hu

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 27 January 2005.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-15 is/are pending in the application.
- 4a) Of the above claim(s) 4-6, 8 and 11-15 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-3, 7 and 9 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 1/27/2004.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

1. Claims 4-6, 8 and 11-15 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected invention, there being no allowable generic or linking claim. Election was made **without** traverse in Paper dated 01-27-2005.

Claim Objections

2. Claims 1-3, 7 and 9 are objected to because of the following informalities and/or defect:

Claim 1 recites the term of "a surface of said top cap layer" but fails to clarify which one of the possible surfaces it refers to.

Appropriate correction is required.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1-3, 7 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Inoue (Inoue et al., JP 2001-230407; of record) in view of applicant's admitted prior

art ("AAPA"), Sheppard (Sheppard et al., US 6,316,793) and/or Dawson (Dawson et al. (US 6,399,493).

Inoue discloses a compound semiconductor device (Fig. 1A; see US 6,639,255 for its English translation), comprising: a substrate (101 and 102); a channel layer (103; GaN); an electron supply layer (104; n-type AlGa_N); a cap layer (105; GaN); a gate electrode (107) disposed on the cap layer and forming a Schottky contact; recesses formed on the source/drain sides; and, source/drain electrodes 106 and 108).

Although Inoue does not expressly disclose that the cap layer can also be n-type and that the bottom surfaces of the recesses can be roughened compared to the top surface of the cap layer, one of ordinary skill in the art would readily recognize that the cap layer can be also be desirably n-type doped for providing more electrons to the channel region, as evidenced in AAPA (see the n-type cap layer 8 in Fig. 8C); and that It is always desirable to form silicided contact to the source/drain region, as evidenced in Sheppard (see the silicided source/drain contacts 20 and 21 in the cover page figure), and such silicided contact can be better formed by roughening the source/drain contact surfaces, as evidenced in Dawson (see the roughened region 42 in the cover page figure).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the n-type cap of into the semiconductor device of Inoue with the source/drain contact surfaces being substantially roughened, per the teachings of Sheppard and Dawson (Dawson et al. (US 6,399,493), so that a device with more electrons for the channel region and with better silicided contact to the

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source and drain regions would be obtained. And, the substantially roughened surfaces would be naturally rougher than the un-roughened surface of the cap layer in the above collectively taught device.

Regarding claim 2, it is noted that the roughness of the roughened source/drain surfaces is an art-recognized parameter of importance subject to routine experimentation and optimization.

Regarding claim 3, it is art-known that an insulating passivation film can be desirably formed to cover the upper surfaces of the device, as further evidenced in Sheppard (see the passivation film 23 in the cover page figure).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Shouxiang Hu whose telephone number is 571-272-1654. The examiner can normally be reached on Monday through Thursday, 7:30 AM to 6:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie C. Lee can be reached on 571-272-1732. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

SH
April 14, 2005



SHOUXIANG HU
PRIMARY EXAMINER